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MISCELLANEOUS REPORT NO. 27

LAKE STATES FOREST FIRE DAMAGE TABLES FOR YOUNG SECOND-GROWTH STANDS

By J. A. Mitchell, Forester

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Lake States Forest Experiment Station

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LAKE STATES FOREST FIRE DAMAGE TABLES
FOR YOUNG SECOND-GROWTH STANDS

By J. A. Mitchell
Lake States Forest Experiment Station [1]

Forest fire damage statistics, to be of value, must be comparable from year to year and from unit to unit. This calls for a common policy and for uniform methods of damage appraisal. To this end, the various protection agencies in the Lake States met in conference, in 1938, and agreed to base damage estimates on current stumpage rates and to evaluate damage to sub-merchantable stands (both planted and natural) on the basis of present worth or their value when merchantable, discounted to their current age.

To simplify the computation involved, the Lake States Forest Experiment Station prepared tables for each major forest type showing the average damage per acre, based on size class, density of stocking, severity of burn, and average prevailing stumpage rates. In 1947 these tables were revised to reflect increased stumpage prices and to consider site, where data were available. Recently these tables have been again revised to permit the use of current local stumpage rates rather than arbitrary average stumpage values. The unit values given in the present tables represent the present worth, or value as an investment, of young second-growth, arrived at by discounting the average yield value of 5- to 9-inch stands to the average age of the smaller size classes recognized, using a uniform stumpage rate of $1 per cord and a discount rate of 5 percent compounded annually.

To determine the loss sustained in a given case, the unit value given in the table (for the type, site, size class, density of stocking, and severity of burn involved) is multiplied by the area burned and by the prevailing local stumpage price per cord of the species concerned. For example: If a medium-stocked 1- to 5-inch stand of good site jack pine is burned over by a light fire, the unit loss (from the table) would be $2.71 per acre. With a current local stumpage price of $3.50 per cord for jack pine and a burn of 15 acres, the estimated loss would be:

$2.71 x $3.50 x 15, or $142.28

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[1] Maintained by the U. S. Department of Agriculture, Forest Service, in coöperation with the University of Minnesota, St. Paul Campus, St. Paul 1, Minnesota.

Explanation of Items Considered in the Tables

To assist understanding of the damage tables the various items included are described briefly as follows:

Type.--The forest types listed are those most common in the Lake States and for the most part are readily identified. For practical considerations, minor variations should be ignored and only one type or set of conditions reported for a single fire unless more than 10 acres are involved.

Site.--Three site classes are recognized--good, medium, and poor. In general, site is indicated by height in relation to age or roughly to diameter. On good sites, for example, dominant and codominant trees will be taller for a given age or d.b.h. than on medium or poor sites. The average height for each size class and site is given in the table as a guide. Unless a site is definitely good or poor, it should be classed as medium. Extremely poor sites, off-site aspen for example, should be classed as non-forest.

Size.--Stands should be classified as to size on the basis of the average diameter at breast height (d.b.h.) of the codominant trees. The size classes recognized are reproduction (under 1 inch d.b.h.), second-growth or saplings (1 to 5 inches d.b.h.), and young-merchantable or poletimber (5 to 9 inches d.b.h.). Stands averaging over 9 inches d.b.h. are considered merchantable and should be appraised at their market or sale value. Scattered larger trees or an understory of small trees should be ignored unless sufficiently important to be appraised separately.

Density.--Stands are classified as to dnesity of stocking before burning as follows:

Good.--Area well stocked, over 70 percent of the growing space utilized.

Medium.--Area moderately stocked, trees somewhat widely spaced or bunched so that only 40 to 70 percent of the growing space is utilized.

Poor.--Only 10 to 40 percent of the growing space utilized by tree growth. Areas with only scattered trees or less than 10 percent stocked are usually classified as non-timbered.

Severity of burn.--Three degrees of severity of burn based on mortality are recognized. These are:

Light.--Less than one-third of the trees killed.

Moderate.--From 1/3 to 2/3 of the trees killed.

Severe.--More than two-thirds of the trees killed.

In general, this represents the effect of light, moderate, and severe burns. Since trees killed accounts for only part of the damage to the stand, however, the loss from light burns is figured at 50 percent, from moderate burns at 75 percent, and from severe burns at 100 percent of the unburned stand value.

Comparison With Previous Tables

The present damage table is the same as that issued in 1936 and 1947 except that the values given are based on a uniform stumpage rate of $1 per cord instead of on average stumpage values. While this makes it necessary to multiply the unit values given by the prevailing stumpage rate for the species in question, as well as by the area burned, it avoids the need for frequent revision of the table because of changing stumpage prices and makes possible the use of current local stumpage rates instead of arbitrary stumpage values. This gives it greater flexibility and should provide more realistic damage values.

Forest fire damage in second-growth stands -- Lake States

(Loss per acre = Table value x current local stumpage rate per cord)

Size class d.b.h.	Average dominant height	Good stocking			Medium stocking			Poor stocking		
		Light burn	Mod. burn	Severe burn	Light burn	Mod. burn	Severe burn	Light burn	Mod. burn	Severe burn
ASPEN-BIRCH										
Good site										
Under 1"	16'	1.92	2.88	3.83	1.28	1.92	2.56	0.64	0.96	1.28
1-5"	42'	3.99	5.98	7.97	2.66	3.99	5.32	1.33	1.99	2.66
5-9"	68'	13.50	20.25	27.00	9.00	13.50	18.00	4.50	6.75	9.00
Medium site										
Under 1"	15'	1.68	2.52	3.36	1.12	1.68	2.24	0.56	0.84	1.12
1-5"	40'	3.67	5.50	7.34	2.45	3.67	4.89	1.22	1.84	2.45
5-9"	64'	13.05	19.58	26.10	8.70	13.05	17.40	4.35	6.52	8.70
Poor Site										
Under 1"	14'	1.40	2.10	2.80	0.93	1.40	1.87	0.47	0.70	0.93
1-5"	38'	3.06	4.59	6.12	2.04	3.06	4.08	1.02	1.53	2.04
5-9"	61'	12.60	18.90	25.20	8.40	12.60	16.80	4.20	6.30	8.40
JACK PINE										
Good site										
Under 1"	7'	2.50	3.75	5.00	1.67	2.50	3.33	0.83	1.25	1.67
1-5"	22'	4.07	6.11	8.14	2.71	4.07	5.43	1.36	2.04	2.71
5-9"	49'	10.80	16.20	21.60	7.20	10.80	14.40	3.60	5.40	7.20
Medium site										
Under 1"	6'	1.70	2.55	3.40	1.13	1.70	2.27	0.57	0.85	1.13
1-5"	20'	3.06	4.58	6.11	2.04	3.06	4.08	1.02	1.53	2.04
5-9"	47'	10.35	15.52	20.70	6.90	10.35	13.80	3.45	5.18	6.90
Poor site										
Under 1"	5'	0.99	1.49	1.99	0.66	0.99	1.33	0.33	0.50	0.66
1-5"	17'	1.87	2.81	3.75	1.25	1.87	2.50	.62	.94	1.25
5-9"	44'	9.45	14.18	18.90	6.30	9.45	12.60	3.15	4.72	6.30

Forest fire damage in second-growth stands -- Lake States (Continued)

(Loss per acre = Table value x current local stumpage rate per cord)

Size class d.b.h.	Average dominant height	Good stocking			Medium stocking			Poor stocking		
		Light burn	Mod. burn	Severe burn	Light burn	Mod. burn	Severe burn	Light burn	Mod. burn	Severe burn
NORTHERN HARDWOODS										
Good site										
Under 1"	10'	2.65	3.98	5.30	1.77	2.65	3.54	0.88	1.33	1.77
1-5"	30'	4.76	7.14	9.52	3.17	4.76	6.35	1.59	2.38	3.17
5-9"	60'	14.62	21.94	29.25	9.75	14.62	19.50	4.88	7.31	9.75
Medium site										
Under 1"	9'	1.55	2.33	3.10	1.04	1.55	2.07	0.52	0.78	1.04
1-5"	25'	3.39	5.08	6.78	2.26	3.39	4.52	1.13	1.70	2.26
5-9"	50'	13.95	20.92	27.90	9.30	13.95	18.60	4.65	6.98	9.30
Poor site										
Under 1"	8'	0.76	1.14	1.52	0.51	0.76	1.01	0.25	0.38	0.51
1-5"	20'	2.11	3.17	4.23	1.41	2.11	2.82	.70	1.06	1.41
5-9"	40'	13.50	20.25	27.00	9.00	13.50	18.00	4.50	6.75	9.00
OAK										
Good site										
Under 1"	13'	3.37	5.06	6.75	2.25	3.37	4.50	1.12	1.69	2.25
1-5"	27'	5.24	7.85	10.47	3.49	5.24	6.98	1.75	2.62	3.49
5-9"	49'	12.60	18.90	25.20	8.40	12.60	16.80	4.20	6.30	8.40
Medium site										
Under 1"	12'	2.23	3.34	4.46	1.49	2.23	2.97	0.74	1.11	1.49
1-5"	24'	4.00	6.00	8.00	2.66	3.99	5.32	1.33	2.00	2.67
5-9"	39'	11.70	17.55	23.40	7.80	11.70	15.60	3.90	5.85	7.80
Poor site										
Under 1"	10'	1.53	2.30	3.07	1.02	1.53	2.04	0.51	0.77	1.02
1-5"	18'	2.89	4.34	5.78	1.93	2.89	3.86	.96	1.45	1.93
5-9"	27'	10.80	16.20	21.60	7.20	10.80	14.40	3.60	5.40	7.20

Forest fire damage in second-growth stands -- Lake States (Continued)

(Loss per acre = Table value x current local stumpage rate per cord)

Size class d.b.h.	Average dominant height	Good stocking			Medium stocking			Poor stocking		
		Light burn	Mod. burn	Severe burn	Light burn	Mod. burn	Severe burn	Light burn	Mod. burn	Severe burn
RED PINE - Average site										
Under 1"	6'	2.07	3.11	4.14	1.38	2.07	2.76	0.69	1.04	1.38
1-5"	17'	3.72	5.58	7.44	2.48	3.72	4.96	1.24	1.86	2.48
5-9"	46'	12.60	18.90	25.20	8.40	12.60	16.80	4.20	6.30	8.40
WHITE PINE - Average site										
Under 1"	5'	3.51	5.26	7.02	2.34	3.51	4.68	1.17	1.75	2.34
1-5"	19'	6.30	9.45	12.60	4.20	6.30	8.40	2.10	3.15	4.20
5-9"	54'	19.35	29.02	38.70	12.90	19.35	25.80	6.45	9.68	12.90
SPRUCE-BALSAM FIR - Average site										
Under 1"		2.29	3.44	4.58	1.53	2.29	3.05	0.76	1.15	1.53
1-5"		5.25	7.87	10.50	3.50	5.25	7.00	1.75	2.62	3.50
5-9"		13.50	20.25	27.00	9.00	13.50	18.00	4.50	6.75	9.00
CONIFEROUS SWAMP - Average site										
Under 1"		0.79	1.18	1.58	0.53	0.79	1.05	0.26	0.40	0.53
1-5"		2.94	4.42	5.89	1.96	2.95	3.93	.98	1.47	1.96
5-9"		12.15	18.22	24.30	8.10	12.15	16.20	4.05	6.08	8.10
SWAMP HARDWOODS - Average site										
Under 1"		2.51	3.77	5.02	1.67	2.51	3.35	0.84	1.26	1.67
1-5"		4.30	6.44	8.59	2.86	4.30	5.73	1.43	2.15	2.86
5-9"		13.50	20.25	27.00	9.00	13.50	18.00	4.50	6.75	9.00
BOTTOMLAND HARDWOODS - Average site										
Under 1"		3.80	5.69	7.59	2.53	3.80	5.06	1.27	1.90	2.53
1-5"		5.89	8.84	11.78	3.93	5.89	7.85	1.96	2.95	3.93
5-9"		14.85	22.28	29.70	9.90	14.85	19.80	4.95	7.42	9.90